

that various changes may be made without departing from the spirit and scope of the invention as defined by the following claims.

What is claimed is:

1. A method for increasing the dynamic range of a multi-dimensional IMS-TOF system characterized by automatically adjusting rates of passage of analyte materials through an IMS drift tube during operation of said system.

2. The method of claim 1 wherein said adjustment of the rates of passage is determined by:

quantifying the total number of analyte molecules delivered to the ion trap in a preselected period of time; comparing this number to the charge capacity of the ion trap;

selecting a gate opening sequence; and

implementing the selected gate opening sequence to obtain a preselected rate of analytes within said IMS drift tube.

3. The method of claim 2 wherein said quantifying step is comprised of:

performing an initial short IMS-TOF pre-scan to determine an experimental sequence, said pre-scan conducted in a signal averaging mode using constant short accumulation times (<1 ms), and comprising several IMS-TOF separations

creating an IMS-TOF vector from data obtained in said pre-scan; and

folding and summing said vector to obtain the total number of ions accumulated in the ion trap during the pre-scan.

4. The method of claim 3 wherein said selecting step comprises:

matching a predesignated pseudo random sequence in a preselected range with the total number of ions accumulated in the ion trap during the pre-scan according to a preselected criteria.

5. The method of claim 4 wherein the pseudo random sequence range extends from 1-bit extended pseudo random sequence (1 ion packet release per IMS separation) to 7-bit extended pseudo-random sequence (64 ion packet releases per IMS separation).

6. The method of claim 4 further comprising the step of conducting a targeted MS/MS experiment by fragmenting precursor ions of interest in an RF ion guide downstream of an IMS drift tube using the same pseudo random sequence as that employed for precursor signal encoding but delayed by the drift time of the species of interest.

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